



Simulations of gravity waves over Antarctica and the Southern Ocean : comparison to balloon observations and investigation of nonorographic sources

Riwal Plougonven, Albert Hertzog, Lionel Guez

► To cite this version:

Riwal Plougonven, Albert Hertzog, Lionel Guez. Simulations of gravity waves over Antarctica and the Southern Ocean : comparison to balloon observations and investigation of nonorographic sources. Symposium OGOA, May 2013, Lyon, France. hal-00840838

HAL Id: hal-00840838

<https://hal.science/hal-00840838>

Submitted on 11 Jul 2013

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Riwal Plougonven (LMD)

Simulations of gravity waves over Antarctica and the Southern Ocean: comparison to balloon observations and investigation of non-orographic sources

Riwal Plougonven, Albert Hertzog and Lionel Guez (LMD, Paris)

Gravity waves in the lower stratosphere above Antarctica and the Southern Ocean have been characterized from observations by superpressure balloons from the Vorcore campaign (Hertzog et al 2008). Mesoscale simulations with the WRF (Weather Research and Forecast Model) are carried out to analyze further the gravity-wave field, with an emphasis on non-orographic waves.

First, the realism of the simulated waves is assessed by comparison to the observations. A satisfactory overall agreement is found, but different behaviour is noted for orographic waves (overestimation in the simulations relative to the observations) and non-orographic waves (underestimation).

Second, the gravity-wave field is analyzed in more detail. It is necessary to quantify orographic and non-orographic waves separately. Orographic waves are larger and more intermittent, yet affect only a limited geographical region. Hence their overall contribution to momentum fluxes entering the stratosphere is comparable to that of non-orographic sources. A diagnostic for intermittency, the Gini coefficient, is proposed.

Third, in order to better identify non-orographic sources, case studies are carried out for episodes of intense momentum fluxes over the Southern Ocean, far from islands. The emitted gravity waves occur over intense and rapid cyclogenesis events (polar lows). It appears that, despite the high latitude, moist effects play a crucial rôle in the emission of the gravity waves.

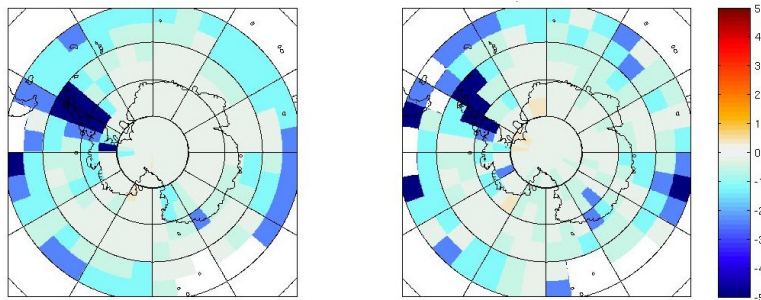


Figure 1: Zonal momentum fluxes at ~19 km from the simulations (left) and the balloon observations (right), averaged over the period 21/10 - 18/12/2005. The simulations are sampled at times and locations where balloons were present (see Plougonven et al 2013). Color range is voluntarily limited to $[-5 ; 5]$ hPa, in order to reveal the spatial structure over the ocean.

Hertzog, A., et al (2008) : Estimation of gravity-wave momentum fluxes and phase speeds from long-duration stratospheric balloon flights. 2. Results from the Vorcore campaign in Antarctica, J. Atmos. Sci., 65, p3065-3070.

Plougonven, R., et al (2013) : Gravity waves over Antarctica and the Southern Ocean: consistent momentum fluxes in mesoscale simulations and stratospheric balloon observations, Q.J. Roy. Met. Soc., 139, p101-118.